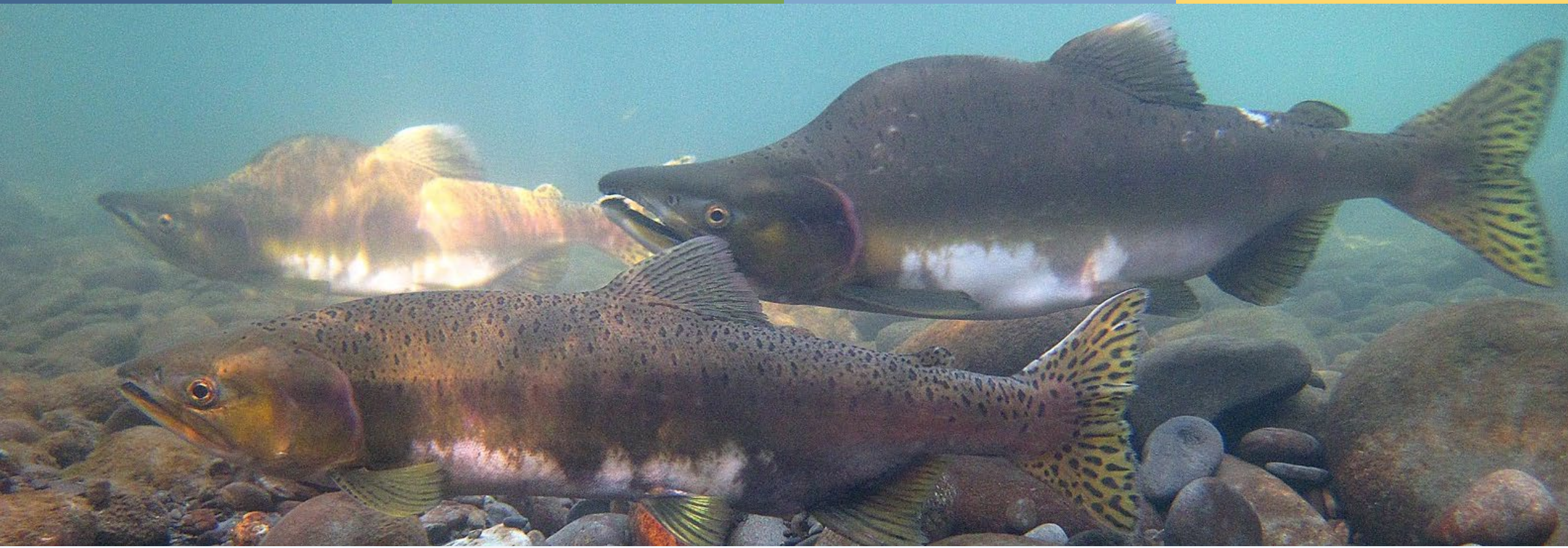


DEPARTMENT OF ECOLOGY
State of Washington

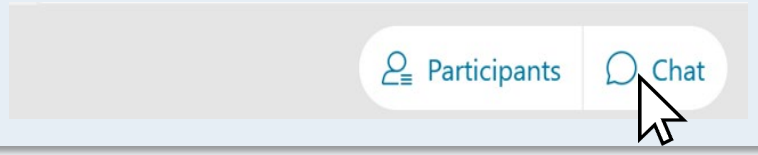
Salmon Spawning Habitat Protection Rule: Preliminary Decisions

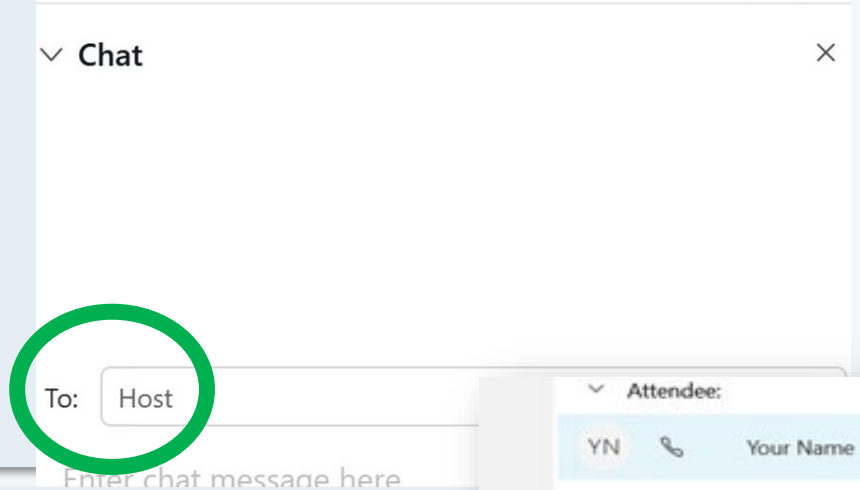
September 21, 2021

1:30pm

How to Participate

You can ask questions via the chat function



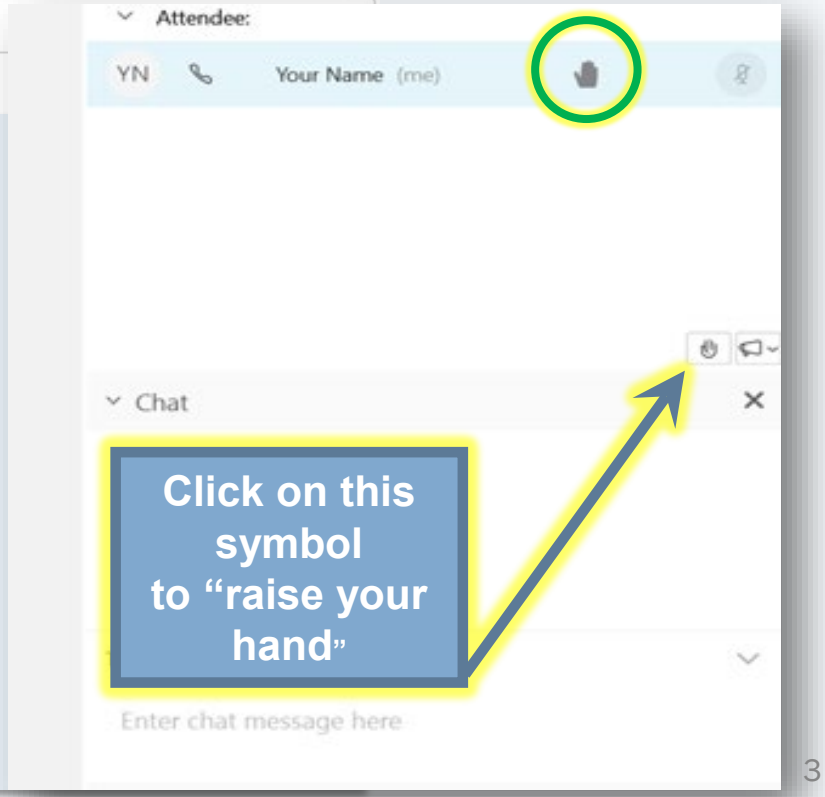


You can also ask questions by raising your hand so we can unmute you

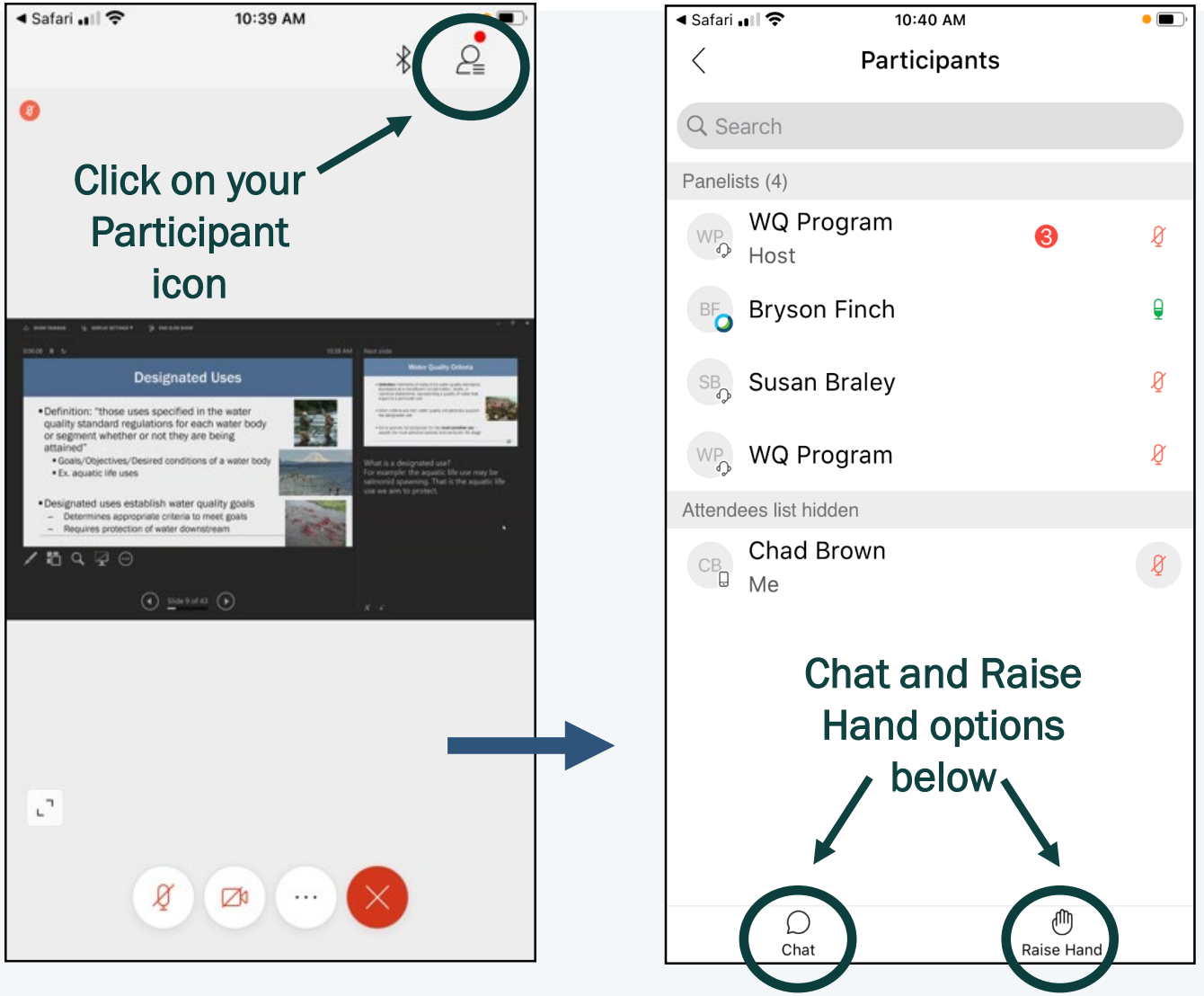
We ask that you:

1. **State your name** first before speaking.
2. **Lower your hand** when you are done speaking

Calling in only? Press *3 to raise your hand



For those joining WebEx via phone or tablet



Thanks for joining us today

Melissa Gildersleeve

Chad Brown

Bryson Finch

Kalman Bugica

Marla Koberstein

Susan Braley

What Will Be Covered Today?

1. Background & Purpose of rulemaking effort
2. Preliminary revisions to dissolved oxygen criteria
3. Rationale for dissolved oxygen criteria
4. Proposed structure of the fine sediment criterion
5. Rationale for parameters used to characterize fine sediment
6. Next steps and questions

Rulemaking Effort to date

Dec 2019

Rulemaking announcement

Oct 2020

Introductory public webinar

Oct 2020 to July 2021

Held 5 science advisory group meetings

Today

Public webinar on preliminary rule decisions

Rule and Purpose of Rulemaking

- Proposed rule will amend the surface water quality standards (WAC 173-201A-200):
  - Revisions to the freshwater dissolved oxygen criteria
  - Development of new fine sediment criterion

- **Purpose**
  - Improve rules that protect salmonid spawning habitat
  - Ensure sufficient DO levels in spawning gravels
  - Ensure physical structure of salmon nests is suitable for spawning success

Dissolved oxygen

Optional subtitle

Salmon eggs and larvae need oxygen to breathe

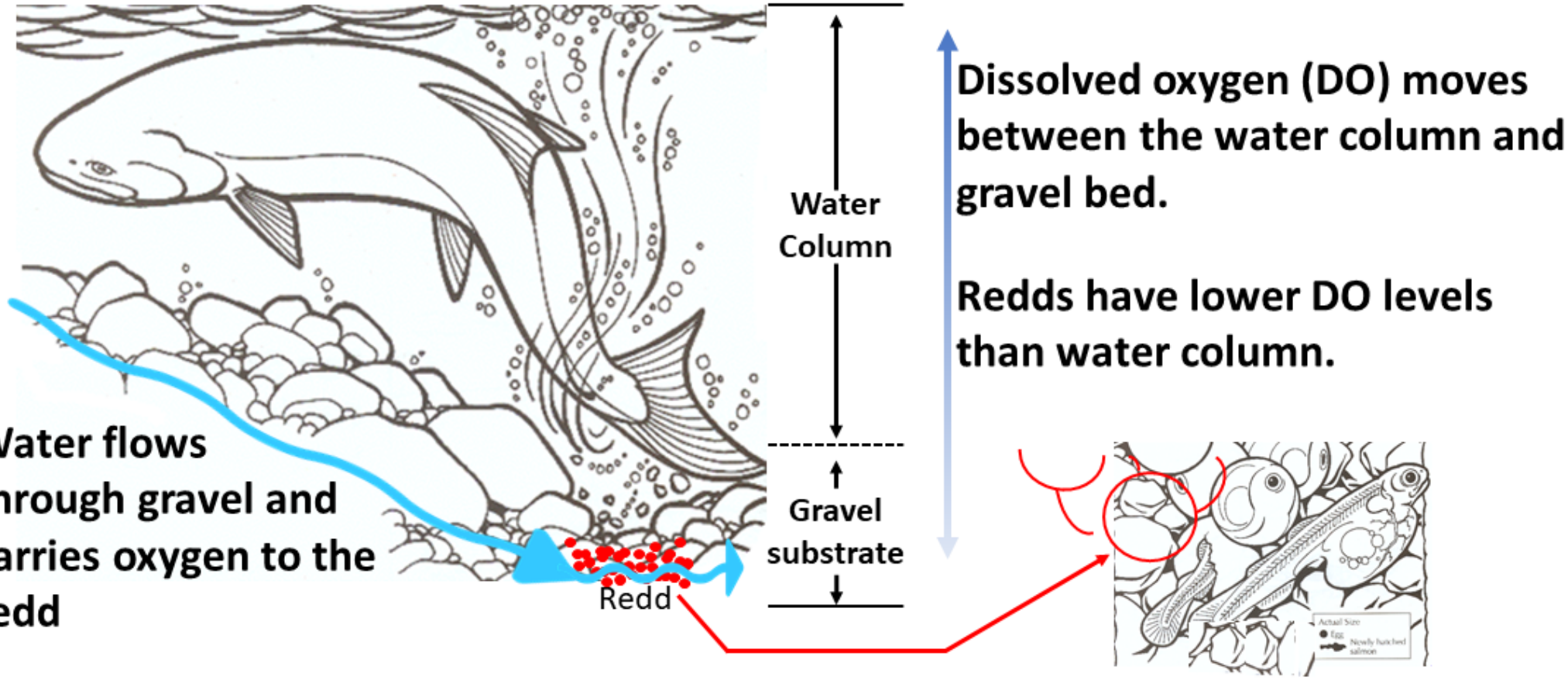


Image modified from: https://www.fws.gov/sacramento/es_kids/Chinook-Salmon/Images/redd_fws.gif

Freshwater DO EPA Recommendations

Embryo and Larval Stages of Salmonids		
Level of Protection	**Water Column DO Recommendation* (mg/L)**	**Intragravel DO Recommendation (mg/L)**
No production impairment	11	8
Slight production impairment	9	6
Moderate production impairment	8	5
Severe production impairment	7	4
Limit to avoid acute mortality	6	3

*These are water column concentrations recommended to achieve the required intragravel dissolved oxygen concentrations. A 3 mg/L different is assumed between the water column and gravels.

Current Freshwater Dissolved Oxygen Criteria

Use Category	DO (mg/L) (1-Day Min)
Char Spawning and Rearing	9.5*
Core Summer Salmonid Habitat	9.5*
Salmonid Spawning, Rearing, and Migration	8.0*
Salmonid Rearing and Migration	6.5
Non-anadromous Interior Redband Trout	8.0*
Indigenous Warm Water Species	6.5
*Salmonid spawning protective levels: 8.0 – 9.5 mg/L	

Preliminary Freshwater DO Criteria

Aquatic Life Use Category	Water column DO concentration (1-day minimum)		Intragravel DO concentration (1-day minimum)
Char Spawning and Rearing	10.0 mg/L or 90% oxygen saturation	OR	8.0 mg/L
Core Summer Salmonid Habitat	10.0 mg/L or 90% oxygen saturation	OR	8.0 mg/L
Salmonid Spawning, Rearing, and Migration	10.0 mg/L or 90% oxygen saturation	OR	8.0 mg/L
Salmonid Rearing and Migration Only	6.5 mg/L or 90% oxygen saturation	OR	Not applicable
Non-anadromous Interior Redband Trout	10.0 mg/L or 90% oxygen saturation	OR	8.0 mg/L
Indigenous Warm Water Species	6.5 mg/L or 90% oxygen saturation	OR	Not applicable

Why a water column value of 10 mg/L?

- National Academy of Sciences (1972):
  - Oxygen criteria to protect eggs should be halfway between maximum (11 mg/L) and high protection levels (9 mg/L)
- EPA GoldBook (1986):
  - “If slight production impairment or a small but undefinable risk of moderate impairment is unacceptable, then one should use the no production impairment (11 mg/L) values as a mean, and slight production impairment (9 mg/L) as a minima.”
- Lack of support for a 3 mg/L DO depression value (EPA 1986 recommendation)
- Scientific literature on DO depression from the water column to gravels
- Intragravel DO protection levels of 8.0 mg/L

DO Depression Assumption

- We are assuming a maximum 2 mg/L decrease in DO from the water column to gravels

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- Literature supports the assumption of a maximum 2 mg/L DO depression in high quality spawning gravels and habitat
- We agree with protective intragravel DO value of 8.0 mg/L
  - Support demonstrated in EPA recommendations (1986) and Hicks (2002)

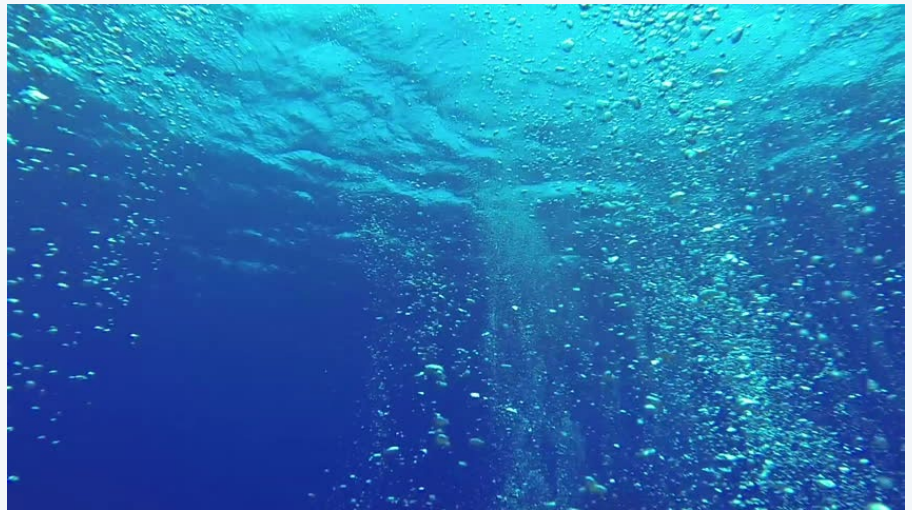
8 mg/L intragravel DO + 2 mg/L DO depression = **10 mg/L** water column protection level

Why include an intragravel DO criteria?

- Provides flexibility for streams with water column DO levels <10 mg/L and DO depression values <2 mg/L
  - Example:
    - Stream A: DO level in water column: 10 mg/L, DO depression value 2 mg/L, IGDO = 8 mg/L
    - Stream B: DO level in water column: 9 mg/L, DO depression value 1 mg/L, IGDO = 8 mg/L
- A more direct measurement of protection levels for early life stages of salmonids
  - Guidance on water quality sampling for IGDO will be necessary

Preliminary Decision to use 90% Oxygen Saturation

- EPA does not have an oxygen saturation recommendation
- EPA has approved 95%, 90%, and <90% oxygen saturation values for states
  - 95%: Oregon, California, & Vermont
  - 90%: Idaho, California, Arizona, Washington (Columbia River)
  - <90%: Maine, Hawaii, California, New Hampshire, Rhode Island, Vermont



Why a 90% oxygen saturation criteria?

- Oxygen saturation measure accounts for temperature and elevation influences on DO
  - As water temperature rises, ability for oxygen to dissolve in water goes down
  - As elevation increases, ability for oxygen to dissolve in water goes down

- Ecology's reference site data

- Need for flexibility when early life stages are not present and stream temperatures are higher

Support for 90% Oxygen Saturation

Designated Aquatic Life Use	Temperature (°C)	Minimum DO level at 90% saturation (mg/L)	Current Washington DO criteria (mg/L)
Salmonid spawning, rearing and migration	17.5 (maximum)	8.6	8.0
	13	9.5	8.0
	10	10.2	8.0
	8	10.7	8.0
	5	11.5	8.0
Core summer salmonid habitat	16 (maximum)	8.9	9.5
	13* (maximum)	9.5	9.5
	10	10.2	9.5
	8	10.7	9.5
	5	11.5	9.5
Char Spawning	12 (maximum)	9.7	9.5
	9* (maximum)	10.4	9.5
	7	10.9	9.5
	5	11.5	9.5

* Supplemental spawning temperature criteria

Support for 90% Oxygen Saturation

- Ecology's Environmental Assessment Program regularly monitors reference sites for changes in water quality
- Of the 63 relatively pristine reference sites, 13 (20.6%) have oxygen saturation levels below 95% and oxygen concentrations below 10 mg/L
- Of the 58 minimally disturbed reference sites, 30 (51.7%) have oxygen saturation below 95%
- This data is likely biased high compared to actual daily minimums

Freshwater DO Criteria: Implementation

Permitting

- Anticipating limited impacts to how permit limits are written
- Possible additional monitoring tools (e.g. % DO saturation)

Total Maximum Daily Loads (TMDLs)

- Existing
  - No not anticipate any changes to EPA approved DO TMDLs
- New
  - DO impairments (nutrients vs. temperature)
  - May need to incorporate additional measures into effectiveness monitoring
  - **Water Quality Assessment:** potential refinement to DO impairments

Non-point program

- Will possibly add additional tools to characterize DO and nutrient related impairments (e.g. % DO Saturation)

Questions?

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Dissolved Oxygen

Fine Sediment Criteria

What is fine sediment?

- Generally particles less than 2 mm
- Sources
  - Erosion, runoff, flooding, land development, in-water activities, and natural stream hydrology
- Importance
  - Excess fine sediment can result in:
    - Loss of habitat
    - Poor water quality
    - Reduced oxygen
    - Reduced embryo hatching success
    - Behavioral changes
    - Mortality

Low in fine sediment

High in fine sediment

Fine sediment is not suitable spawning habitat

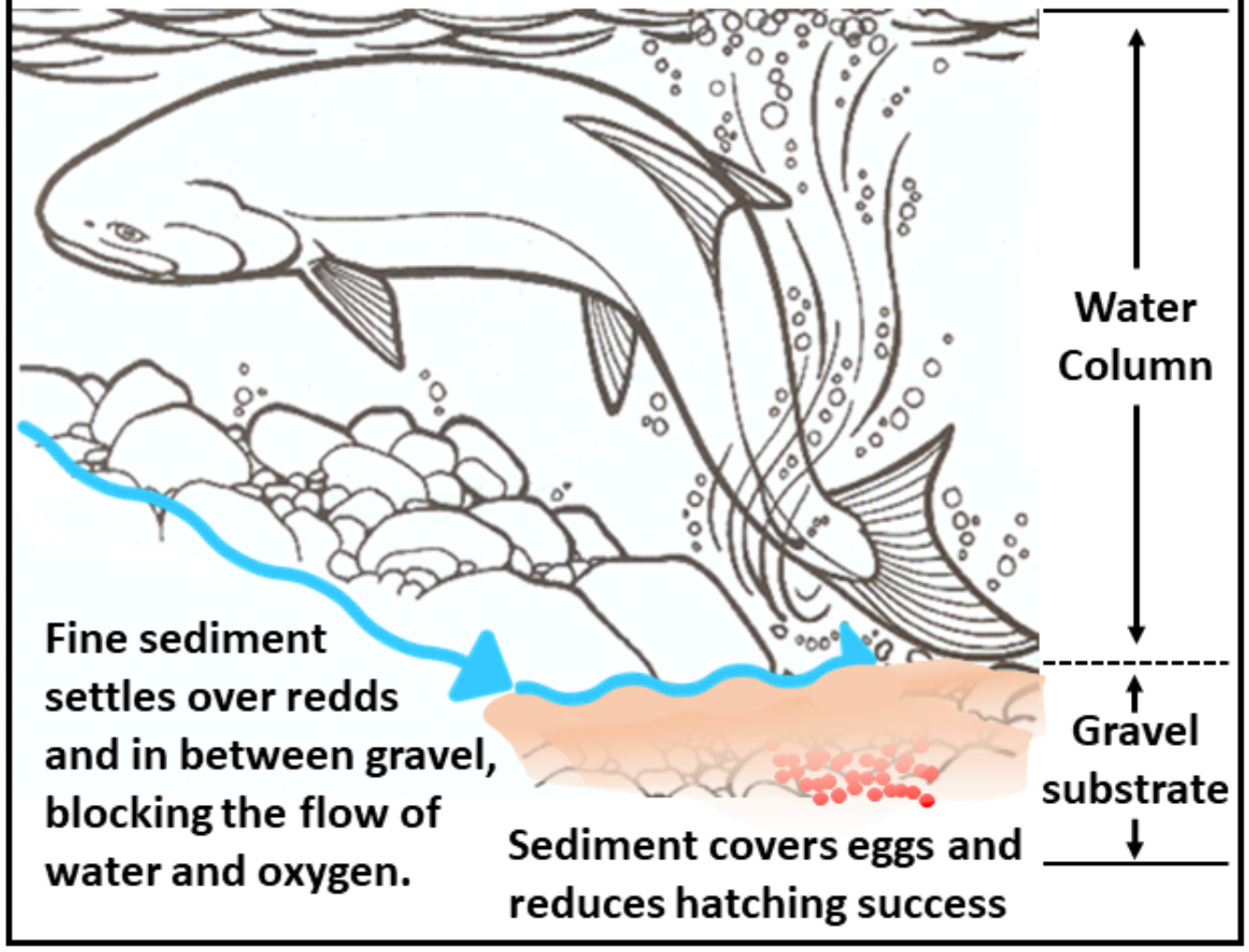


Image modified from: https://www.fws.gov/sacramento/es_kids/Chinook-Salmon/Images/redd_fws.gif

Narrative or Numeric Fine Sediment Criteria?

- Ecology's preliminary decision is to add a narrative criterion that specifically addresses fine sediment (< 2mm)

Why?

- Limited relationships between parameters used to quantify fine sediment and biological endpoints
- A holistic understanding of the water body is needed

Example:

Water bodies shall not contain fine sediment (<2 mm) from anthropogenic sources at levels that cause adverse effects on aquatic life, their reproduction, or habitat.

Fine Sediment Assessments

Environmental Compartment	Measure	Primary or Optional
Water Column	Suspended Solids	Optional
Streambed	Percent Substrate	Primary
Streambed	Subsurface Fines	Optional* (if measuring intragravel dissolved oxygen)
Streambed	Relative Bed Stability	Primary
Chemical	Intragravel Dissolved Oxygen	Optional* (if measuring subsurface fines)
Biological	Fine Sediment Biotic Index	Primary

Fine Sediment Measures: Sources

1. Fine sediment must be from anthropogenic sources

- An assessment of human disturbance and riparian habitat as well as additional watershed information will be needed
- Naturally occurring sources of sediments will not result in an impairment listing (e.g. glacial-fed streams with high sediment loads)

Fine Sediment Measures: Water Column

2. <u>Suspended solids concentration</u> - OPTIONAL

Why?

- Total suspended solids measure only captures a portion of the sample (excludes sands) and has shown to be an unreliable measure of solids
- Turbidity and light penetration measures do not provide specificity to characterize fine sediment
- Water column based measure is optional due to high temporal variability, dependence on flow, and limited relationship with fine sediment in substrate

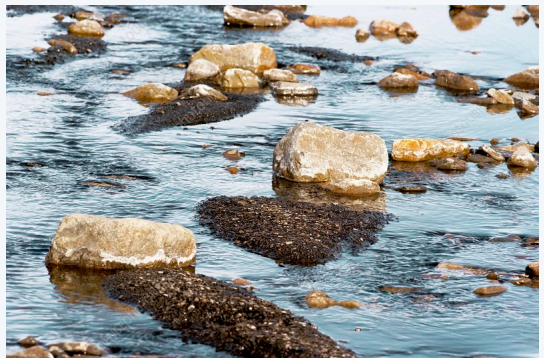
Fine Sediment Measures: Streambed

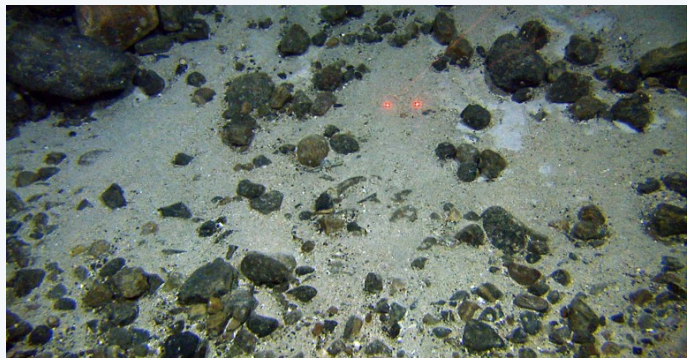
3. Percent surface substrate (visual) - PRIMARY
   Relative bed stability - PRIMARY
   Percent subsurface sediment - OPTIONAL if measuring IGDO

- These parameters are representative of both site-specific fine sediment conditions (percent substrate & subsurface fines) as well as a catchment level assessment of sediment movement (relative bed stability)
- Streambed measures are a direct measurement of sediment quality

Why percent surface fines (visual)?

- Larson et al. (2019) reported percent fines was the most attributable factor to poor stream health in WA streams surveyed
- Sutherland et al. (2010) concluded that visual assessment of percent fines was the 2nd best predictor of sediment deposits by considering land use
- Standardized method by EPA and Ecology
- Measured in Ecology's Watershed Health Monitoring (WHM) Program
- Existing data on many water bodies in WA
- Used by Colorado, New Mexico, Montana, Idaho, and Oregon (draft)



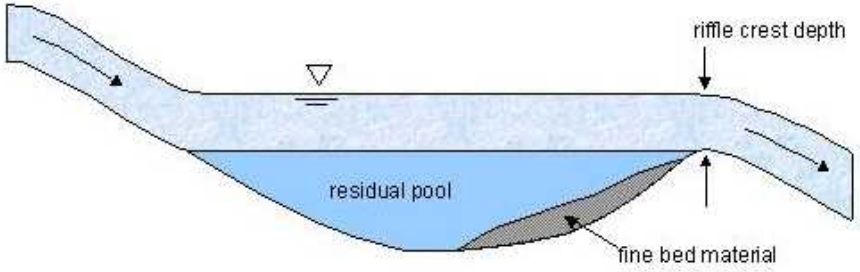


Why relative bed stability?

- Represents a more holistic and catchment level approach to sediment stability (similar to riffle stability index)
- Larson et al. (2019) reported RBS was the 2nd most attributable factor to poor stream health in WA streams surveyed
- Standardized method by EPA and Ecology
- Measured in Ecology's Watershed Health Monitoring Program
- Existing data on many water bodies in WA
- Used by New Mexico and Oregon (draft)

Why percent subsurface fines?

- Sutherland et al. (2010) concluded that percent subsurface fines was the best predictor of sediment deposits by considering land use
- Several studies demonstrating thresholds for survival and habitat quality
- Provides more direct information about spawning habitat than a visual assessment
- Optional measure if IGDO is measured

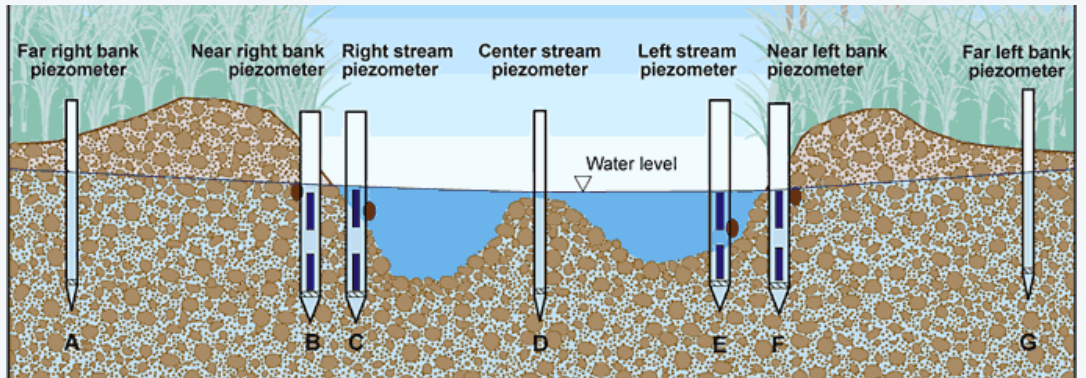


Fine Sediment Measures: Water Chemistry

4. <u>Intragravel dissolved oxygen level</u> – OPTIONAL if measuring subsurface fines

Why?

- Direct measurement of dissolved oxygen exposure to early life stages of fish
- Several studies demonstrating protective levels for early life stages of salmonids
- Accounts for several factors (substrate size, permeability, sediment oxygen demand, water flow, groundwater influences, etc..) that can influence dissolved oxygen



Fine Sediment Measures: Biological

5. Fine sediment sensitivity index - PRIMARY

Why?

- Index is available that specifically looks at fine sediment sensitive species
- Relates sediment quality with a biological response
- Standardized method used by EPA and Ecology
- Measure within Ecology's Watershed Health Monitoring Program
- Existing background data on many water bodies in WA
- Used by Colorado and Oregon (draft)

Fine Sediment Implementation

- **Permitting**
  - What would a new impairment listing mean for dischargers to that water?
    - Some permittees currently have limits for total suspended solids
    - Possibly more monitoring and new methods for dischargers
    - Update during the 5 year reevaluation of permits

- **Total Maximum Daily Loads**
  - Possibly more monitoring and new methods used in evaluating sediment and in effectiveness monitoring
  - Don't anticipate any changes to EPA approved TMDLs
  - Water Quality Assessment: add a fine sediment listing methodology

- **Non-point**
  - Another tool to examine the discharge of pollution and better assess fine sediment pollution

Questions?

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Fine Sediment

Next Steps

- Proposed rule: tentatively mid-October
  - Release proposed rule and open public comment period
- Rule adoption: early 2022
- Future work
  - Develop methods in the water quality assessment (Policy 1-11) for fine sediment impairments and hold public review
  - Finalize methodology within 18 months after rule adoption – implement in next Water Quality Assessment

Questions?

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